

What is claimed is:

1. A method of etching, comprising:
providing a substrate having a patterned mask over at least one metal layer in a processing chamber; and
exposing the metal layer to a gas mixture through the mask, the gas mixture comprising a chlorine-containing gas and a fluorine-containing gas.
2. The method of claim 1, wherein the at least one metal layer comprises at least a first metal layer selected from the group consisting of niobium, titanium and tantalum.
3. The method of claim 2, wherein the at least one metal layer further comprises a second metal layer selected from the group consisting of niobium, titanium and tantalum.
4. The method of claim 1, wherein the step of exposing further comprises:
flowing at least one of Cl_2 , BCl_3 , CCl_4 , SiCl_4 and HCl into the processing chamber.
5. The method of claim 1, wherein the step of exposing further comprises:
flowing at least one of CF_4 , CHF_4 and NF_4 into the processing chamber.
6. The method of claim 1, wherein the mask comprises a photoresist layer.
7. The method of claim 6, wherein the mask further comprises an anti-reflective layer disposed between the photoresist layer and the at least one metal layer.
8. The method of claim 7, wherein the anti-reflective layer further comprises at least one of Si_3N_4 and polyamide.
9. The method of claim 1 further comprising:
forming a plasma from the gas mixture.

10. The method of claim 1 further comprising:
removing the mask.
11. The method of claim 10, wherein the step of removing the mask further comprise:
exposing the mask to a plasma comprising oxygen.
12. A method of etching, comprising:
providing a substrate having a first metal layer, a second metal layer disposed on the first metal layer, and a patterned mask disposed over the second metal layer;
and
exposing the second metal layer through the mask to a gas mixture in a processing chamber; the gas mixture comprising a chlorine-containing gas and a fluorine-containing gas.
13. The method of claim 12, wherein the first metal layer comprises niobium and the second metal layer comprises titanium.
14. The method of claim 12, wherein the first metal layer comprises tantalum and the second metal layer comprises niobium.
15. The method of claim 12, wherein the first metal layer comprises tantalum and the second metal layer comprises titanium.
16. The method of claim 12, wherein the substrate further comprises a layer of Si_3N_4 disposed under the first metal layer and a layer of SiC disposed under the layer of Si_3N_4 .
17. The method of claim 12, wherein the step of exposing further comprises:
flowing at least one of Cl_2 , BCl_3 , CCl_4 , SiCl_4 and HCl into the processing chamber.

18. The method of claim 17, wherein the step of exposing further comprises:
flowing at least one of CF_4 , CHF_4 and NF_4 into the processing chamber.
19. The method of claim 12, wherein the step of exposing further comprises:
flowing Cl_2 and CF_4 into the processing chamber.
20. The method of claim 19, wherein the step of exposing further comprises:
forming a plasma from the gas mixture.
21. The method of claim 20, wherein the step of forming the plasma further comprises:
inductively coupling about 200 to 3000 Watts of power to the gas mixture.
22. The method of claim 21 further comprising:
applying about 0 to 500 Watts of bias power;
maintaining the substrate at about 10 to 350 degrees Celsius; and
maintaining a chamber pressure of about 2 to 50 mTorr.
23. The method of claim 12, wherein the mask comprises:
a photoresist layer disposed on the second metal layer; and
a silicon carbide layer underlying the first metal layer.
24. The method of claim 23, wherein the etch selectivity of the first metal layer to photoresist is at least 1:1; and
wherein the etch selectivity of the first metal layer to silicon carbide at least 1:1.
25. The method of claim 1 further comprising:
removing the mask.
26. The method of claim 25, wherein the step of removing the mask further comprise:
exposing the mask to a plasma comprising oxygen.

27. The method of claim 26, wherein the step of exposing and removing are performed without removing the substrate from the processing chamber.

28. The method of claim 12, wherein the substrate further comprises a dielectric layer disposed under the first metal layer, the dielectric layer comprising at least one of Si_3N_4 , SiC and HfO_2 .

29. The method of claim 12, wherein the step of exposing further comprises:
forming a trench through the first and second metal layers.

30. The method of claim 30, wherein the step of forming the trench further comprises:

extending the trench into a dielectric layer disposed below the first metal layer.